DOCUMENT RESUME

ED 196 419 IR 009 023

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TITLE Communications Technology and Telelibrary Services.
PUB DATE 9 Jun 80
NOTE 25p.: Paper presented at the Annual Conference of the Special Libraries Association (71st, Washington, DC, June 9, 1980).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Communications Satellites; Computers; Library Role; Online Systems; *Special Libraries; *Telecommunications
IDENTIFIERS Telefax

ABSTRACT

This review of the world of telecommunications and its effect on special libraries includes discussions on the use of satellites to facilitate document teledistribution, online bibliographic searches, remote access to databases, and teletex systems. It is contended that the growing network of domestic satellites and the decreasing cost of services will introduce competition, thus ensuring that libraries are not limited to one communication source. It is further argued that these events may change the role of the traditional library. A number of illustrations are appended. (Author/ILS)

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COMMUNICATIONS TECHNOLOGY & TELELIBRARY SERVICES

by

Walter L. Morgan

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COMMUNICATIONS TECHNOLOGY AND TELELIBRARY SERVICES*

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INTRODUCTION

This paper reviews the world of telecommunications and its effect on the special librarian.

RECENT HISTORY

Peter Drucker's Second Industrial Revolution dealt with the combination of motors and machines. The spread of fractional horsepower to many tasks that are taken for granted in today's library or home is exemplified in Figure 1. How many motors are in a library? There may be motor-driven microfilm and microfiche readers/printers, electric typewriters, computer terminals, copy machines, electric pencil sharpeners, and fans. A typical home now has 40 to 70 motors which, although out of sight, are an integral part of Drucker's Second Industrial Revolution.

*This paper is based upon work performed at COMSAT Laboratories under the sponsorship of the Communications Satellite Corporation (COMSAT). It was presented at the 71st Annual Conference of the Special Libraries Association in Washington, D.C., June 9, 1980.

In Drucker's Third Industrial Revolution [1] he envisions the combination of information processing and production equipment or the so-called "smarter" machines. Microprocessor-controlled heating and cooling is being applied to both industrial buildings and homes. Digitally controlled machinery cuts intricate parts from sheets of metal, plastics, or other materials. Oftentimes this computer-aided manufacturing (CAM) is in turn driven by documentation and tapes created on computer-aided design (CAD) equipment. The combination of CAD and CAM promotes situations in which computers are actually assisting in the design of their next generation. Some current Singer sewing machines for the home are combinations of elementary information processing and machinery, which perform intricate sewing steps through the use of microprocessors. Word processing is another example of this type of combination. It seems far better to use unintelligent machines for repetitive jobs than to consume more people. People should be involved in new and innovative developments and not monotonous tasks.

James Burke, who is the author of Connections [2] (which later was made into a PBS-TV series), has a different view of the world's technological advancement as shown in Figure 2. His book presents eight technologies that changed the world and are combining to effect still other changes. These include the combination of telecommunications and rockets to form communications satellites

and the combination of telecommunications and computers, which is being called computication or teleinformation. The marriage of rockets and television, of course, has produced satellite television distribution, particularly through cable systems around the country. Computers and television united to form new teletext services which are being offered in England, France, and Canada, and experimentally in the United States.

Teletext systems, known variously as Viewdata, Prestel, Ceefax, and Teledon, allow a home-viewer to receive selected information, such as train schedules from Washington to New York or the weather report. Upon request, it will list Consumer Reports studies on automotive tires. The user is then able to select a desired manufacturer and query the system for the name of a local tire dealer. Various forms of teletext are available. Some use the telephone, such as GTE Telenet's Viewdata; some are broadcast over the air (such as experiments which will be conducted in Washington using the local public broadcasting service channel and the Canadian Teledon system), or distributed through cable TV systems or a combination of cable-TV and satellite.

Teletext systems operate both on a 1- and 2-way basis. The 1-way systems often operate with a "frame-grabber." The user selects a frame, which resembles a page in a book, from an index. A long, but finite, series of frames are transmitted continuously on a cyclic basis. The frame-grabber waits for the appropriate

frame, seizes it from the air, stores, and displays the frame on the television screen as a static image. The image remains until the user requests a new frame or turns off the service.

In the 2-way systems (which require some form of user-to-source communications such as a telephone), the user may request a frame from a large library. The frame is sent only if requested and no cyclic format is needed. In some cases the desired information is transmitted over the communications line, and in others it may be broadcast over the air in a special time slot. These new teletext services are comparable to a minilibrary upon demand in the home. Both archival and current data (i.e., encyclopedia and stock market) may be accessed.

Figure 3 shows the combination of computation equipment and communications-designated computication or teleinformation. The computication-related elements are shown in lower case letters and include other services such as point of sale and electronic funds transfer. The upper case deals with teleinformation and also includes telepublishing, such as is presently being accomplished by the Wall Street Journal and Time, and direct television broadcasting.

One of the key elements in terms of library services is document teledistribution. Through the use of high-speed satellite circuits, entire documents may be transmitted very rapidly from one location to another. This is especially interesting for solving

some of the traditional interlibrary loan problems. With the electronic distribution of these documents, pages of a report or book may be scanned and transmitted at a high speed to a distant location. At no time does the actual paper or film copy leave the owning library's premises. This form of document distribution has recently been demonstrated by the Satellite Business Systems (SBS) organization.

Remote access to data bases is already widespread in many libraries. The availability of mini, micro-, and home-computers with the ever-decreasing cost of small earth stations and the availability of cable television services to approximately 30 percent of the population will promote other opportunities. The nontraditional or even nonlibrary approaches for accessing various data bases may allow users to predetermine their needs. Upon visiting the library, they may already have selected a particular publication and know the page which contains the needed information. Remote access is already being used extensively in such networks as Medline (National Institute of Health), Lockheed Information Systems, Bibliographic Retrieval Services, Systems Development Corporation, Dow Jones, the National Periodical Center, OCLC, RLIN, WLN, and UTLAS.

The Source Telecomputing Corporation is offering low-cost ($2.65/hour after 6 p.m.) remote access for many home computers (such as the Apple, Radio Shack, and Commodore). If libraries do

not institute on-line bibliographic searches, the home and desk-top computer may become alternatives and thus change the traditional role of the library. Although this may not occur, the issue of the changing role of the library in view of developing techniques in the dissemination of information must be addressed.

The cost of receive-only earth stations has declined dramatically in the last 6 years. In 1974, the cost of an earth station ranged between $80,000 and $100,000; consequently, there were very few. By 1978, the price had dropped to $20,000, and there were about 1,000 earth stations. Today these simple earth stations can be bought for under $5,000.

Presently there are 5,000 earth terminals; in fact, it may be possible to find one at the far end of your local cable TV system or around the corner (see Figure 4). This is not a prediction for the year 2000, but a current development. Since these earth stations are capable of being shared, services can be provided to a number of different users. Most earth stations now are designed for receiving only, and their principal function is to receive TV programs for distribution either as alternate, independent, or PBS programs. Cable television is the largest user of these services. Another use involves the dissemination of audio programs for radio stations or teletype news.

Figure 6 shows the conversion of the 1-way earth station of Figure 5 into 2-way service, which is a relatively modest change.

Since the 1-way stations have already proved their ability to earn money for the cable and broadcasting industry, entrepreneurs are exploring ways to expand their income by sharing the earth stations. This type of sharing, which is permitted by recent Federal Communications Commission ruling, presents an opportunity for the telelibrary.

Another type of earth station, shown in Figure 7, is for SBS customers. This particular site is located atop a building in an industrial park and may be the location of a special library. Many industries will provide this type of new service operating directly into their buildings. Once again, this is not in the distant future (the SBS service begins January 1, 1981). Opportunities are opening for special libraries every day.

Figure 8 shows the domestic satellites of 1980. There are three United States systems, which have a total of eight operating satellites. Soon SBS will join these, and later (pending FCC approval) additional satellite services will be provided by the Southern Pacific Communications Co., Hughes Aircraft, General Telephone & Electronics, and the Bell System. Competition in satellite services will ensure that libraries are not limited to only one source of communications capability. This is particularly important as competition introduces innovations into the communications marketplace, which should be beneficial to libraries. Already SBS has announced a very high-speed document transfer system that may be useful in eliminating some of the interlibrary loan problems.

Figure 9 shows the cost history of satellite telecommunications services. The lower part of the figure shows the amount that INTELSAT (the International Telecommunications Satellite Organization) has charged its members for the lease of the space segment for one international voice channel per year. The top curve is the U.S. Cost of Living Index which reached 242.5 at the end of April 1980. Since 1965, inflation has tripled. At the same time, charges for satellite communications have been reduced by a factor of 6 to 1. Since, in terms of real dollars, there has been a net reduction of 18 to 1, INTELSAT is now charging about 5 percent of the amount it charged 15 years ago.

Figure 10 shows the cost of satellite and terrestrial telecommunications. Although the terrestrial costs dropped for many years, a 5-percent increase was granted just recently. Figure 11 shows computing charges in terms of the cost per unit of capacity, which have also been decreasing with time. The eventual emerging of satellite communications and computing with their declining costs should sustain further cost reductions.

Figure 12 shows capabilities available within the United States for remote data access services. P.O.T.S. represents plain old telephone service, which has been available for many years and is typical telephone operation. These telephone lines will support 300, 1,200, 2,400 baud, or 4,800 bit/s (possibly achieve even 9,600 bit/s); however, for consistent results, specially conditioned lines may be necessary). Many of the higher speed

facsimile machines now initially attempt 9,600 bit/s. If this rate cannot be supported, the rate will then drop to 4,800 or 2,400 bit/s. The WESTAR and SATCOM satellites now routinely use 56,000 bit/s and 1.5 and 3.0 million bit/s. Still higher capabilities will be possible in the near future.

The 56,000-bit/s (56-kbit/s) rate may be used for high-speed facsimile, medium-speed computer-to-computer communications, or for document distribution. The 1.5- and 4-Mbit/s rates are primarily for data base to data base communications and for high-resolution weather photographs. Since it costs less to provide one 56 kbit/s than a large number of slow-speed circuits which sum to the same capacity, use of these higher speed circuits may be economical in many applications. Since telecommunications can be a major cost of searching remote data bases, this is welcome news. With computer terminals, the 56-kbit/s rate is a more "natural" machine speed, so that some (and in some cases, perhaps all) buffering costs may be pared.

How will this influence the special library? These events may encourage the development of satellite libraries which are distributed throughout a corporation or agency. The potential for single-manned or unmanned libraries in far-flung offices or plants will exist. A central library (or libraries) will fulfill incoming requests and interact with the corporate users. A librarian has the opportunity to be an active participant in the expansion of information services.

REFERENCES

[1] Peter F. Drucker, "Managing the Information Explosion," The Wall Street Journal, April 10, 1980.

[2] James Burke, Connections, Boston, Massachusetts; Little Brown & Company, 1978.

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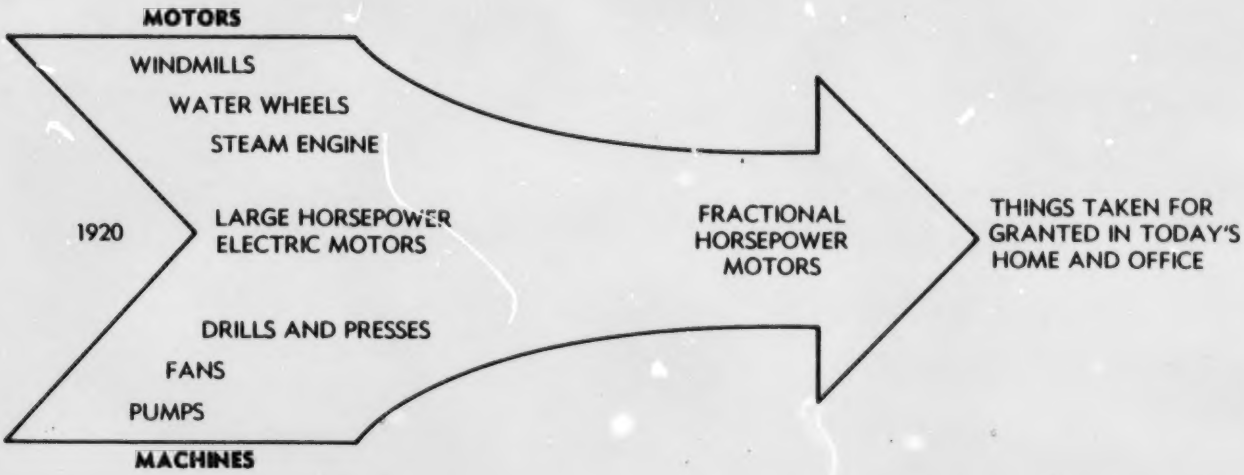
Figure 8. Domestic U.S. Satellites

Figure 9. Satellite Cost Reductions

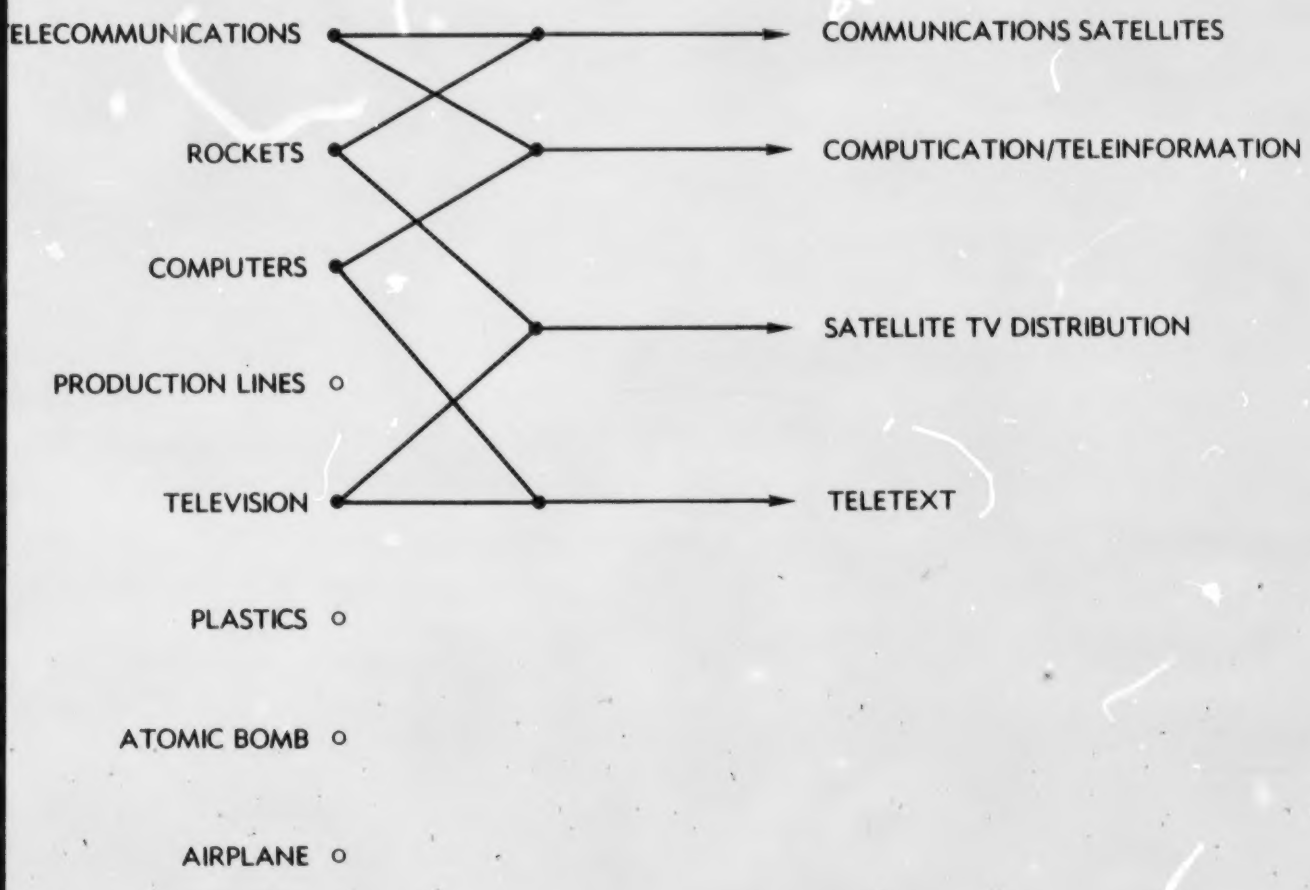
Figure 10. Satellite and Terrestrial Cost Comparison

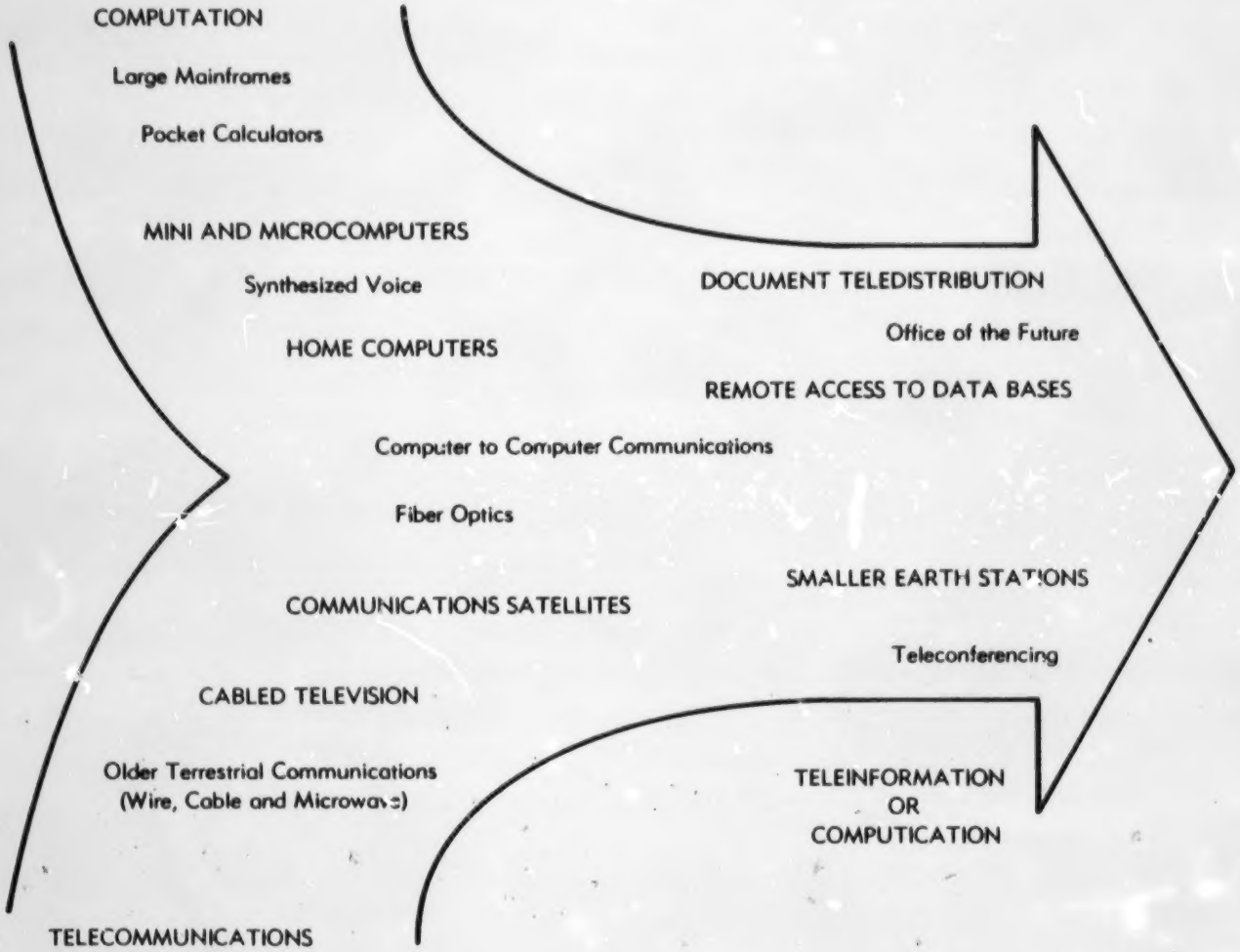
Figure 11. Computing Cost

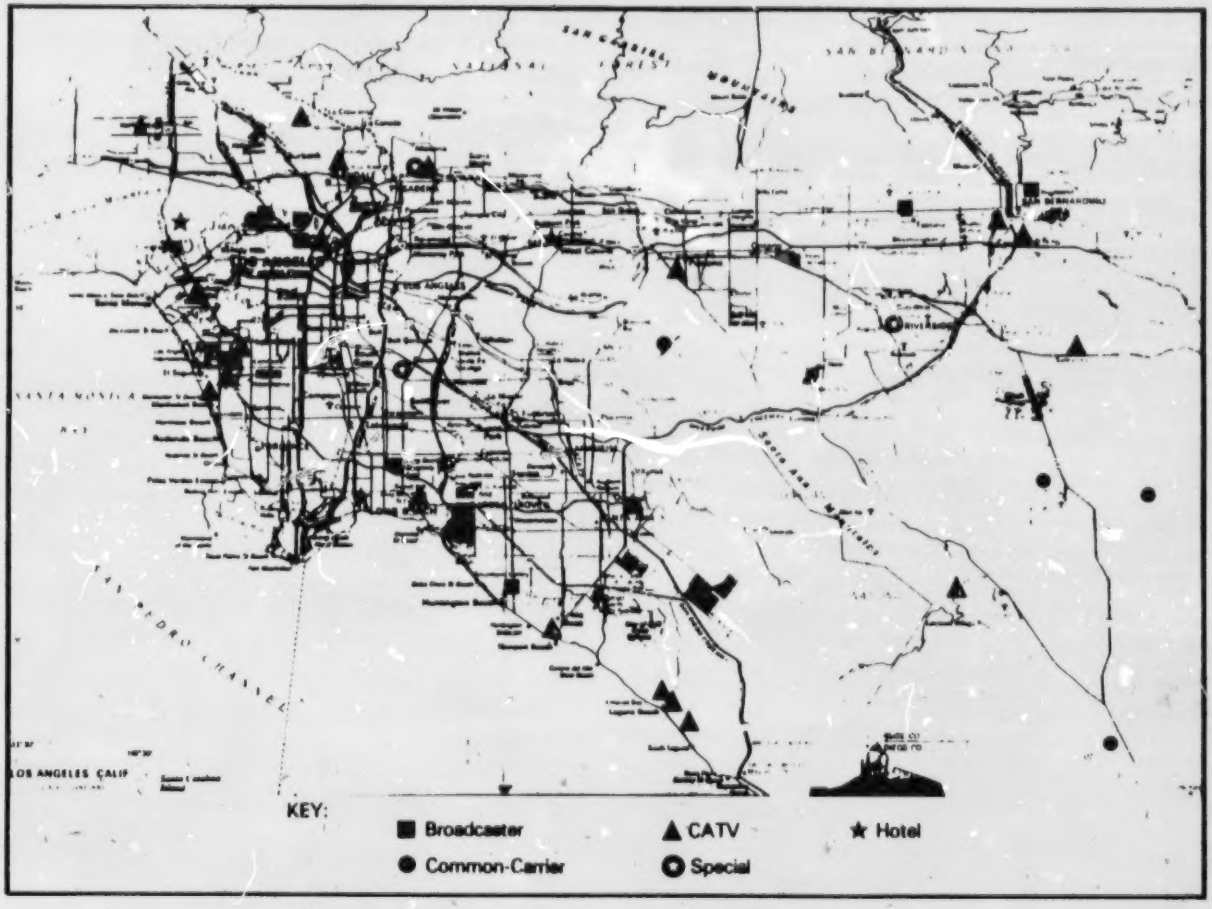
Figure 12. Bit-Rate Capabilities

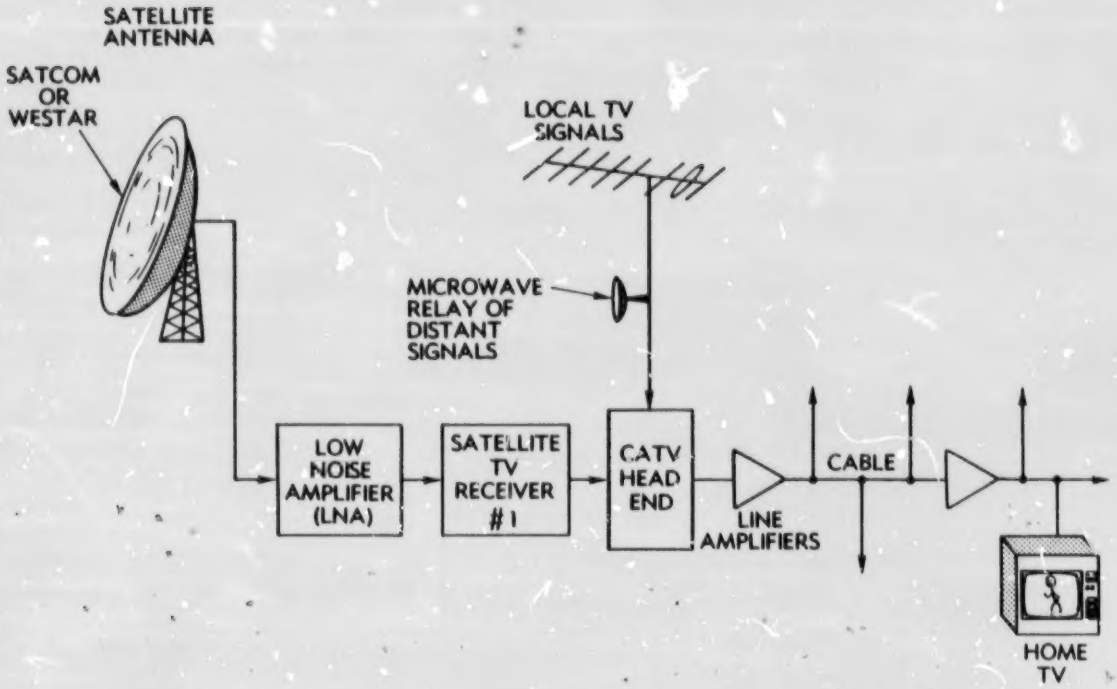

MOTORS
WINDMILLS
WATER WHEELS
STEAM ENGINE
1920
LARGE HORSEPOWER ELECTRIC MOTORS
DRILLS AND PRESSES
FANS
PUMPS
MACHINES
FRACTIONAL HORSEPOWER MOTORS
THINGS TAKEN FOR GRANTED IN TODAY'S HOME AND OFFICE

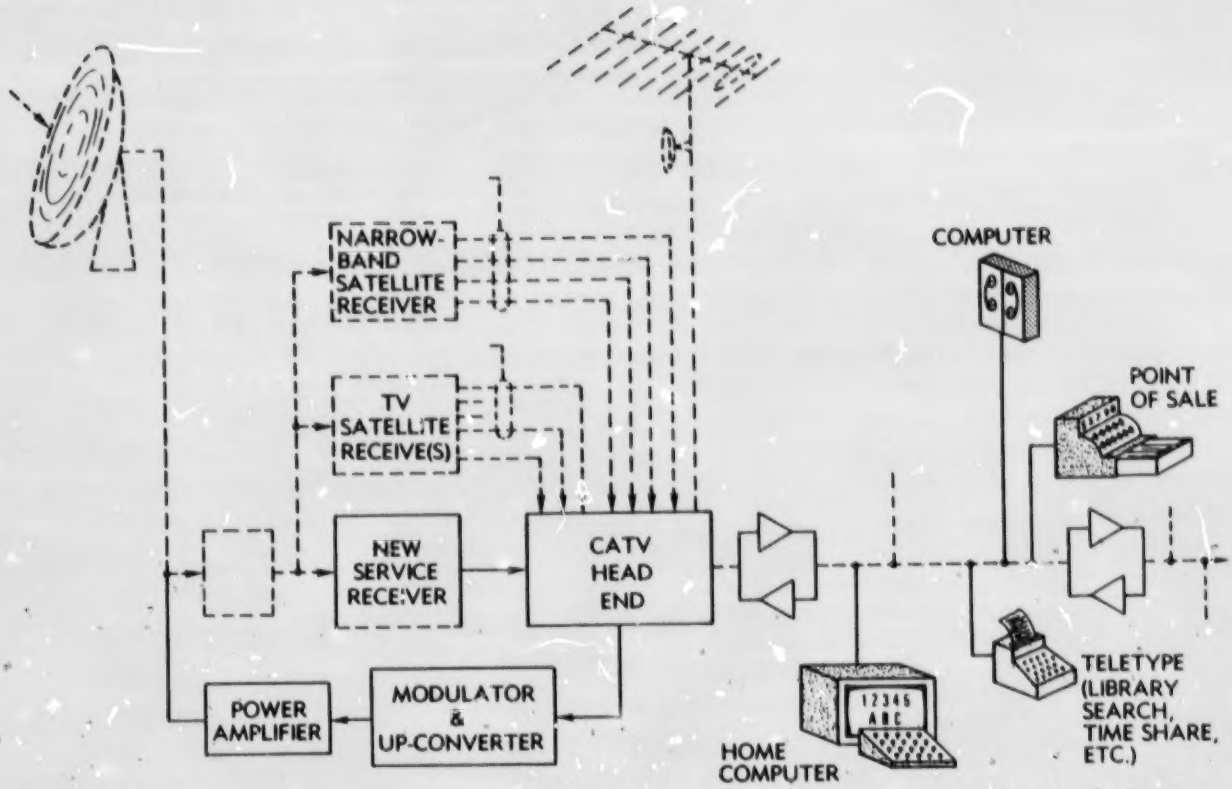
EIGHT BASIC INVENTIONS THAT CHANGED THE WORLD:



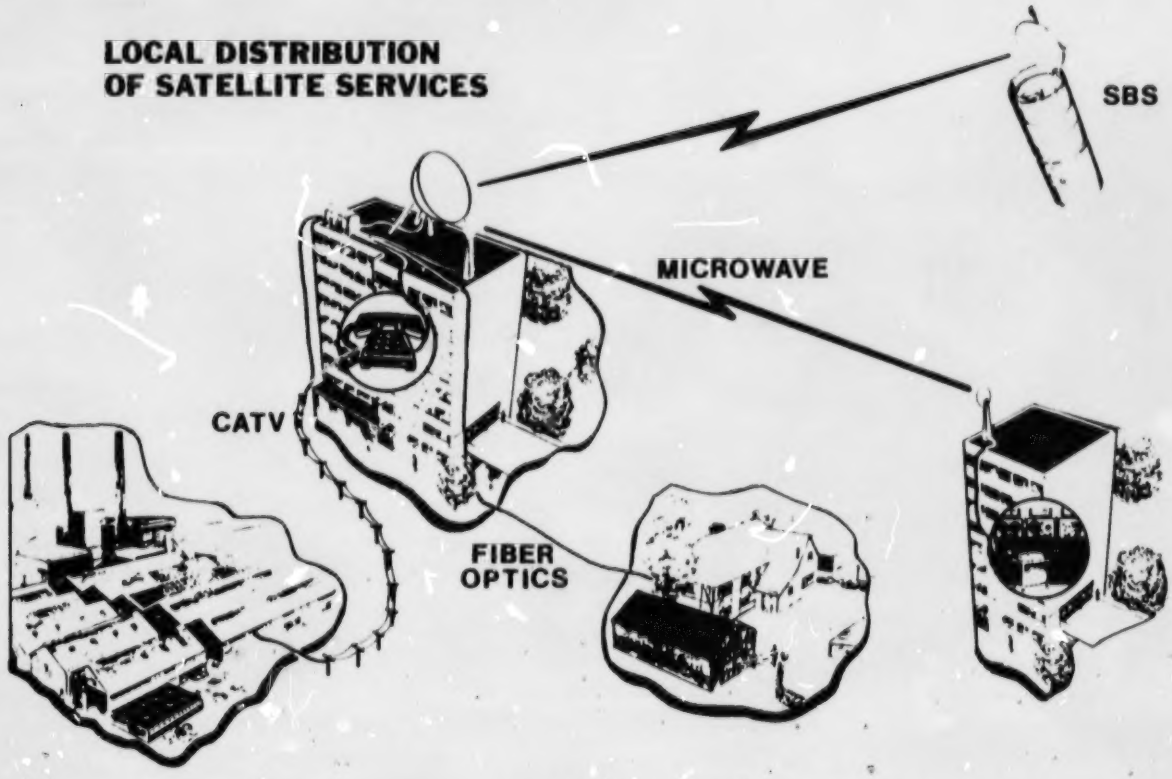

COMPUTATION
Large Mainframes
Pocket Calculators
MINI AND MICROCOMPUTERS
Synthesized Voice
HOME COMPUTERS
Computer to Computer Communications
Fiber Optics
COMMUNICATIONS SATELLITES
CABLED TELEVISION
Older Terrestrial Communications
(Wire, Cable and Microwave)
TELECOMMUNICATIONS
DOCUMENT TELEDISTRIBUTION
Office of the Future
REMOTE ACCESS TO DATA BASES
SMALLER EARTH STATIONS
Teleconferencing
TELEINFORMATION
OR
COMPUTICATION

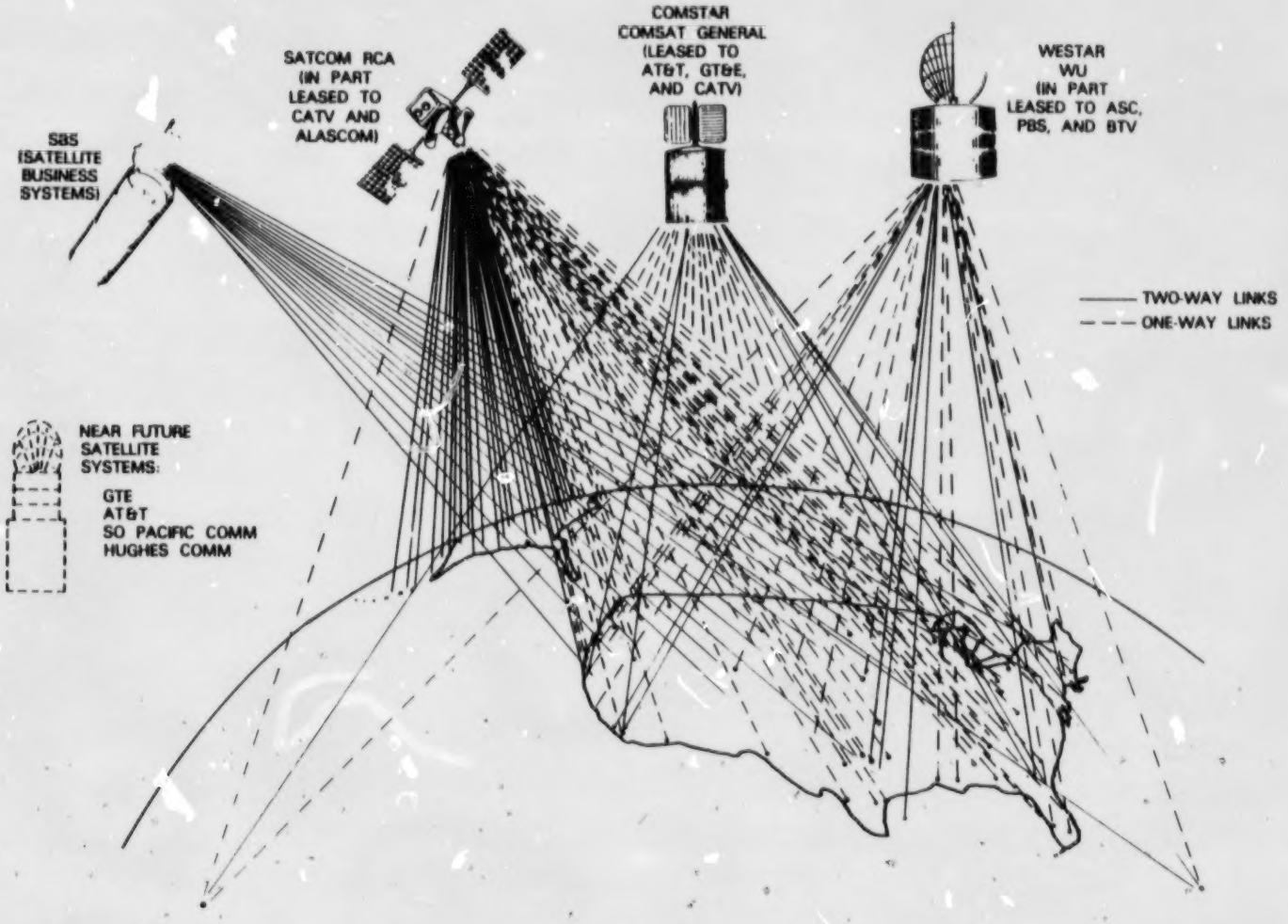

KEY:
Broadcaster
CATV
Hotel
Common-Carrier
Special

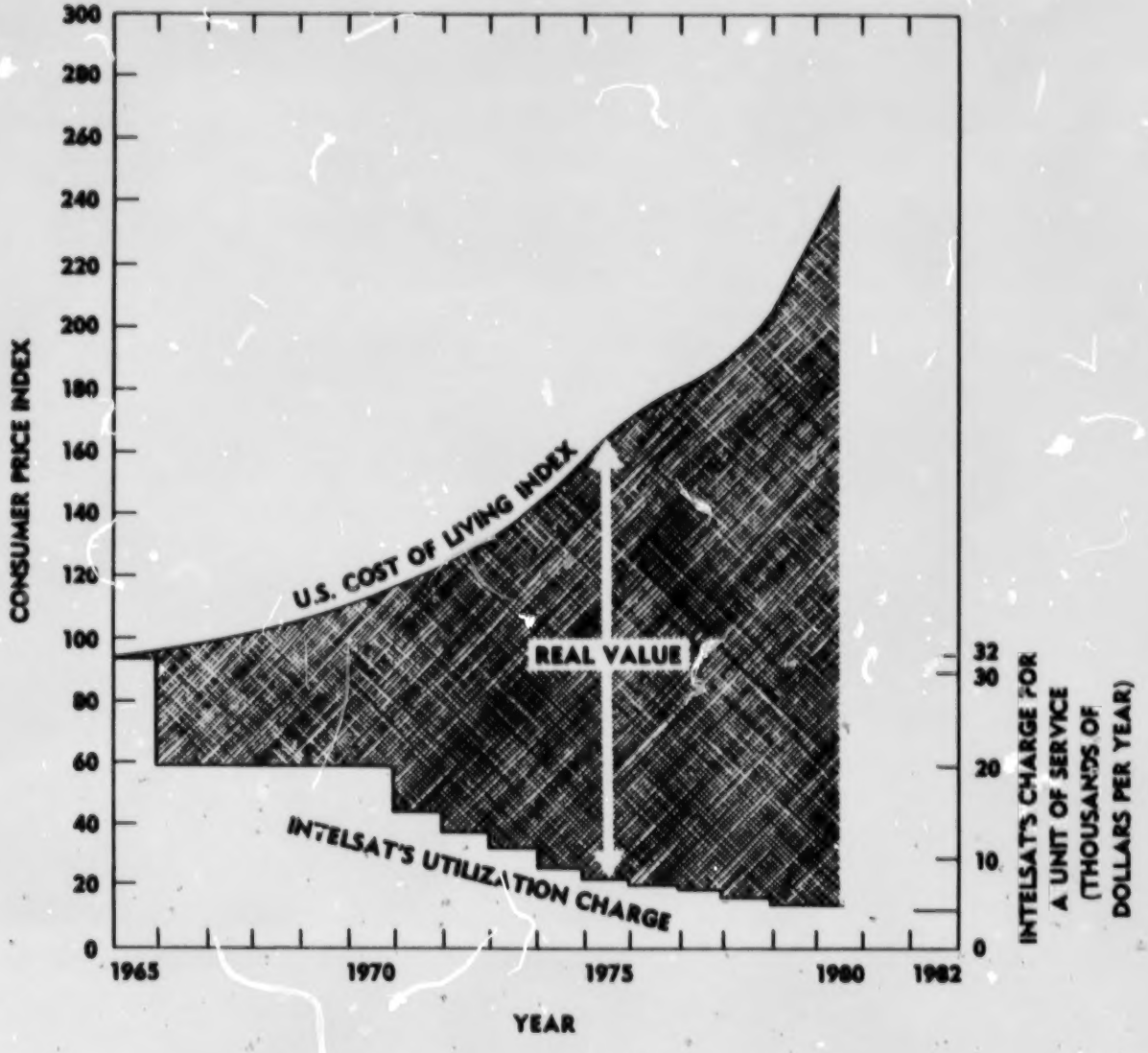

SATELLITE ANTENNA
SATCOM OR WESTAR
LOCAL TV SIGNALS
MICROWAVE RELAY OF DISTANT SIGNALS
LOW NOISE AMPLIFIER (LNA)
SATELLITE TV RECEIVER #1
CATV HEAD END
LINE AMPLIFIERS
CABLE
HOME TV

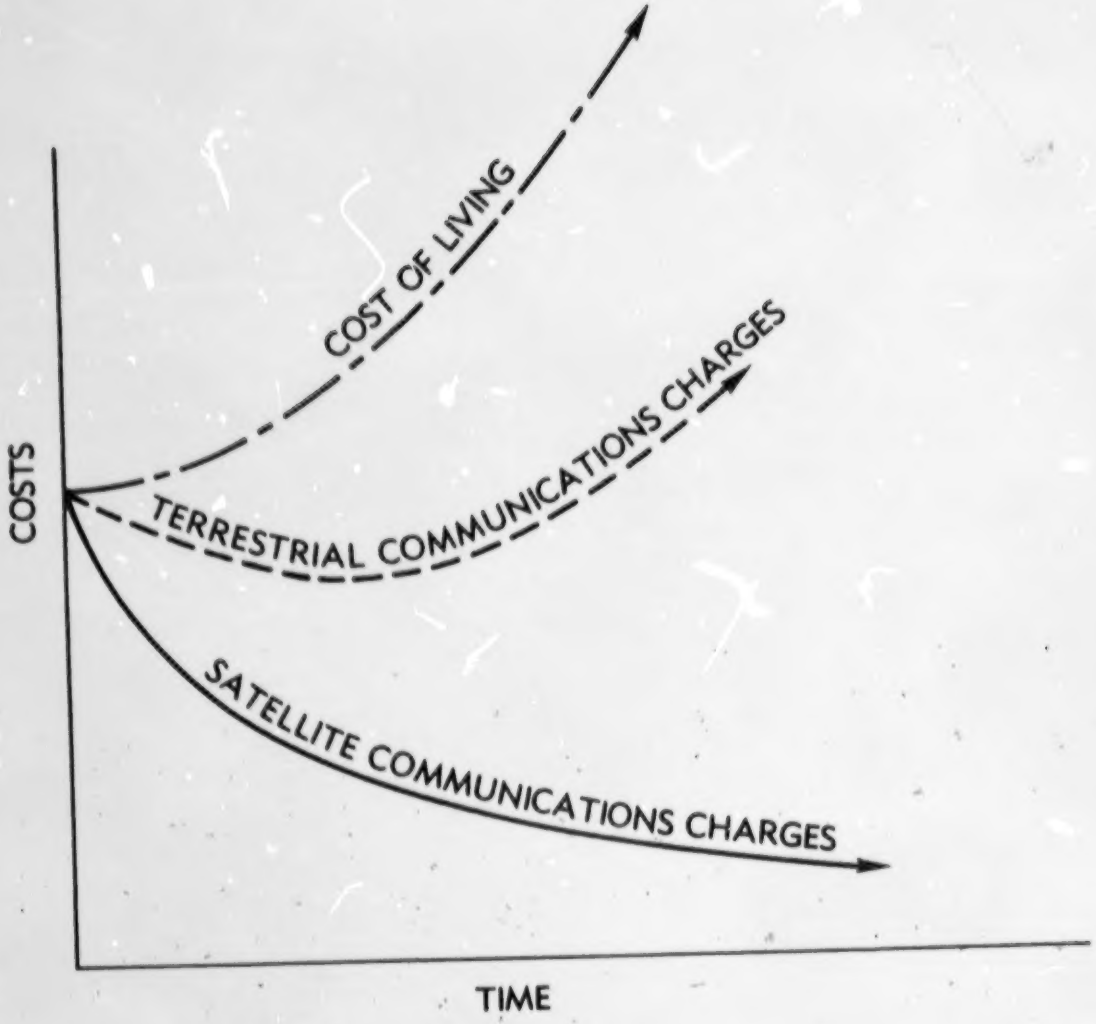

NARROW-
BAND
SATELLITE
RECEIVER
TV
SATELLITE
RECEIVE(S)
NEW
SERVICE
RECEIVER
CATV
HEAD
END
POWER
AMPLIFIER
MODULATOR
&
UP-CONVERTER
COMPUTER
POINT
OF SALE
TELETYPE
(LIBRARY
SEARCH,
TIME SHARE,
ETC.)
HOME
COMPUTER
12345
ABC

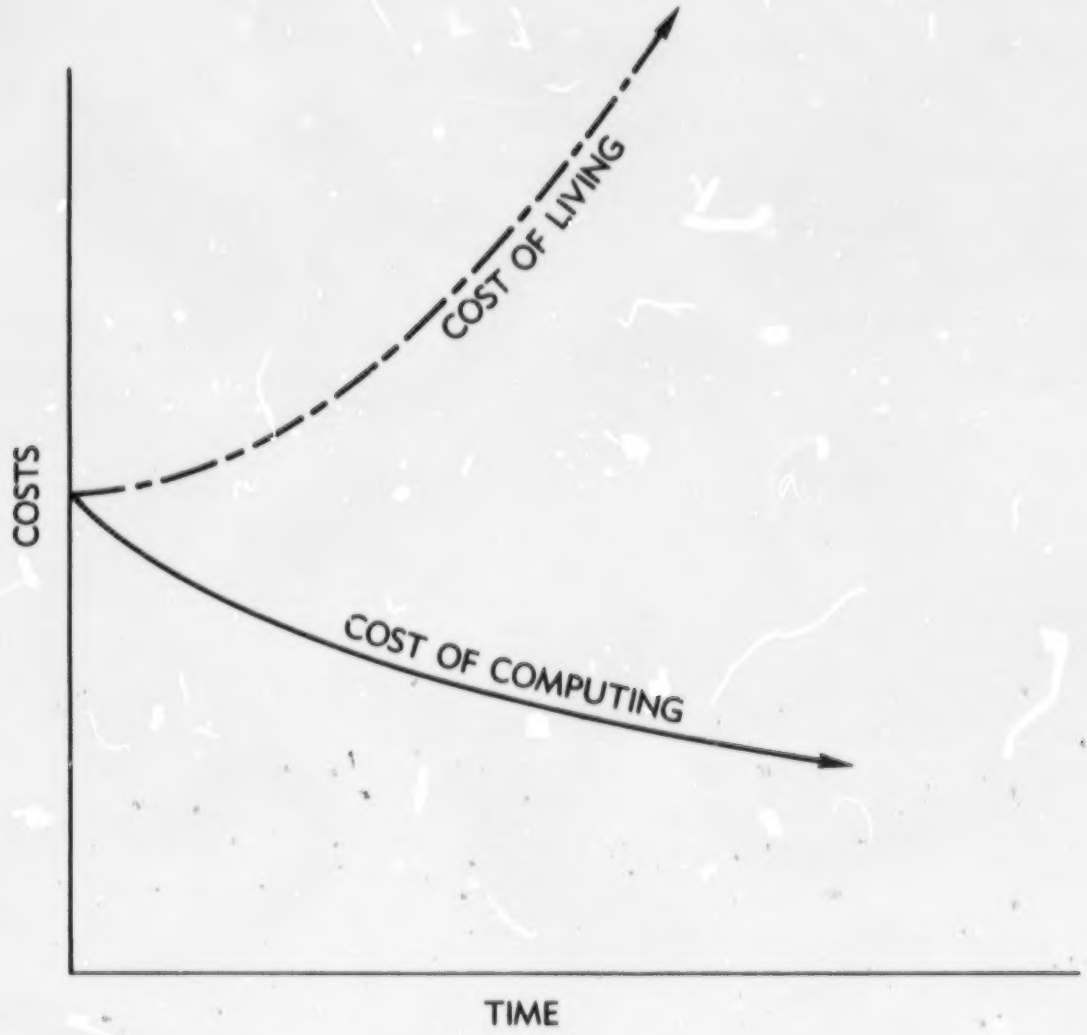
LOCAL DISTRIBUTION OF SATELLITE SERVICES

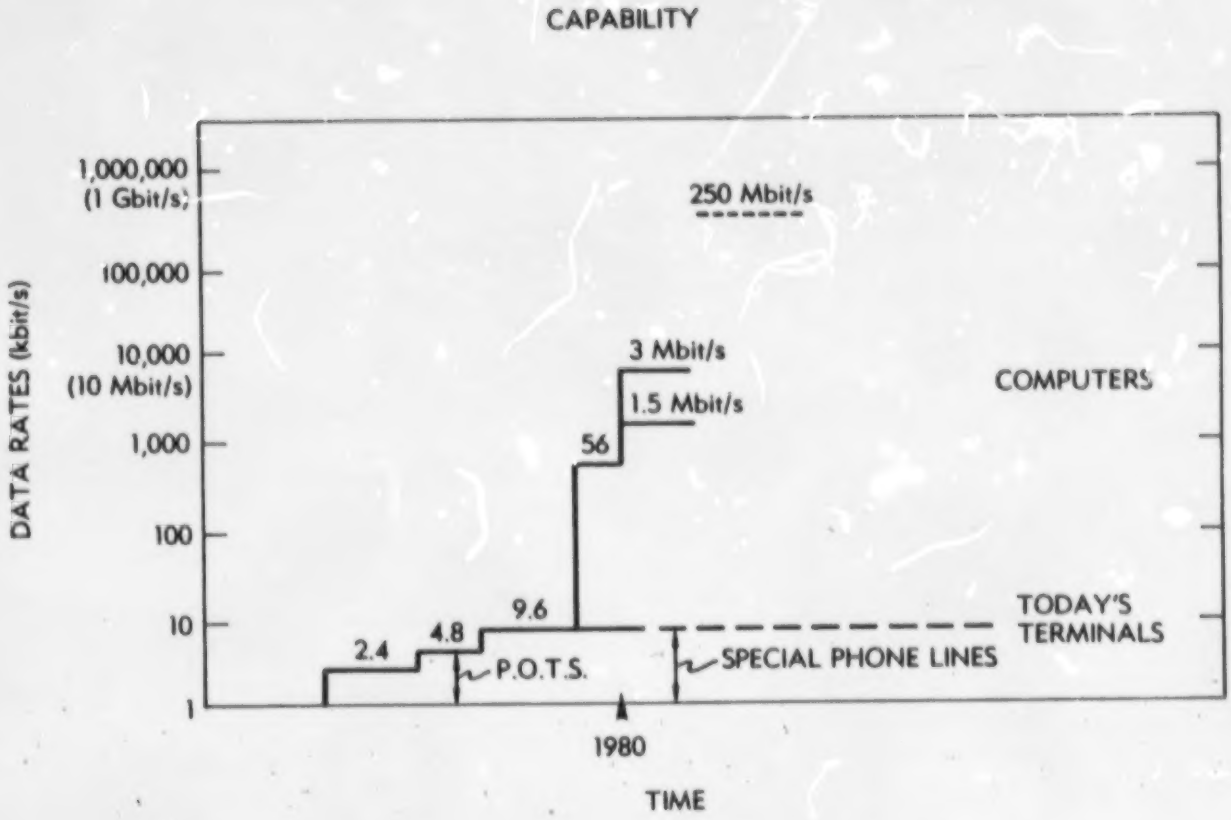



SATCOM RCA
(IN PART
LEASED TO
CATV AND
ALASCOM)
COMSTAR
COMSAT GENERAL
(LEASED TO
AT&T, GT&E,
AND CATV)
WESTAR
WU
(IN PART
LEASED TO ASC,
PBS, AND BTV
SBS
(SATELLITE
BUSINESS
SYSTEMS)
TWO-WAY LINKS
ONE-WAY LINKS
NEAR FUTURE
SATELLITE
SYSTEMS:
GTE
AT&T
SO PACIFIC COMM
HUGHES COMM


CONSUMER PRICE INDEX
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
U.S. COST OF LIVING INDEX
REAL VALUE
INTELSAT'S UTILIZATION CHARGE
1965
1970
1975
1980
1982
YEAR
32
30
20
10
0
INTELSAT'S CHARGE FOR A UNIT OF SERVICE (THOUSANDS OF DOLLARS PER YEAR)


COST OF LIVING
TERRESTRIAL COMMUNICATIONS CHARGES
SATELLITE COMMUNICATIONS CHARGES
COSTS
TIME


COSTS
COST OF LIVING
COST OF COMPUTING
TIME


CAPABILITY
DATA RATES (kbit/s)
1,000,000
(1 Gbit/s)
100,000
10,000
(10 Mbit/s)
1,000
100
10
1
250 Mbit/s
3 Mbit/s
1.5 Mbit/s
COMPUTERS
56
9.6
4.8
2.4
TODAY'S
TERMINALS
P.O.T.S.
SPECIAL PHONE LINES
1980
TIME